



# Bicycle Phone Charger

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## TOOLS:

- [Colored electrical tape \(1\)](#)
- [Drill press \(1\)](#)
- [Hammer \(1\)](#)
- [Hot glue gun \(1\)](#)
- [Multimeter or Continuity Tester \(1\)](#)

## PARTS:

- [DC motor \(1\)](#)
- [Female USB connector \(1\)](#)
- [Wiring \(1\)](#)
- [Plywood \(1\)](#)
- [Nails \(1\)](#)
- [Zip ties \(1\)](#)
- [Dowel rod \(1\)](#)
- [Wheel \(1\)](#)

## SUMMARY

With electrical components from a common printer, you can make a device that will attach to a bike and charge your cell phone at a certain speed. Here is how.

## Step 1 — Background Information

- A phone charger that you plug into your wall is essentially something that converts the electricity from your outlet to a form of energy that the phone can use.
- The electricity from the wall outlet is alternating current (AC) while the phone's charging circuit is constructed to run on direct current (DC).
- The motor that we use in this project will be a DC motor, so we will not have to worry about power conversion.
- One thing to consider is the power output of the motor. We will look at how to test it later, but generally you do not want to go over what your phone charger puts out.
- Most chargers produce around 5.5-9V at 550-900mA. The current that our motor produces can be lower than the phone charger's; that will only result in a longer charging time. You do not, however, want to voltage to be out of this range, or the current to be higher than 900mA.

## Step 2 — Electrical Installation, Part 1: Gathering Parts



- Before everything is assembled, you need to get the parts and test them to ensure that they are working correctly.
- To source the motor, we recommend using an older printer that is either broken or obsolete. Also, you can try going to Goodwill to purchase a cheap older printer. The bigger they are, the more motors they have, as a general rule. We used a Canon inkjet printer that was no longer working and got all the necessary parts.
- Take apart the printer carefully, and keep all the motors and the drive belts that come with them. Also hold on to the screws that keep the motors attached to the printer chassis.
- If your printer is new enough, it may have a female USB connector as well. Remove this and save it. If it doesn't, you may want to try a computer supply store for a cable that has a female USB end.
- The motor(s) you should have are usually in the correct voltage range, since most printers use 6V, 9V, or 12V. We will test these later. Some of the other basic parts and materials you will need are wire, electrical tape, access to a drill press, and a multimeter.

### Step 3 — Electrical Installation, Part 2: Motor Testing



- To properly test the motor, first you want to find some kind of battery, preferably a 9V battery. Hook the motor up to the terminals (there should be two wires coming from the motor, a positive and negative). Red is usually positive, so hook that up to the positive terminal of the battery.
- Run the motor for a little bit and see if it runs hot. If not, then the motor is most likely okay with that voltage. Try to determine which way the motor is spinning, because we will want to spin it the opposite direction to generate a usable voltage.
- The next step is to spin the motor yourself to generate a voltage, hopefully enough to charge your phone. You will need access to a drill press for this part.
- Some drill presses will spin at the desired RPM (which is around 3,000 for this application). However, many do not.
- If your drill press does not, determine the diameter of one of the spinning parts of the drill press. Then determine the diameter of the hub that is on the motor. Divide the first number by the second, and multiply that by the RPM of your drill press. This will give you the RPM that the motor will spin at.
- Hook up the multimeter to the motor to measure the voltage it produces. Wrap some tape around the area on the drill press you are planning on using to give it some grip. Turn on the drill press, hold the motor against it firmly, and determine if there is a voltage created.
- If not, your connections may be loose, so try to get better contact between the motor wires and the multimeter.

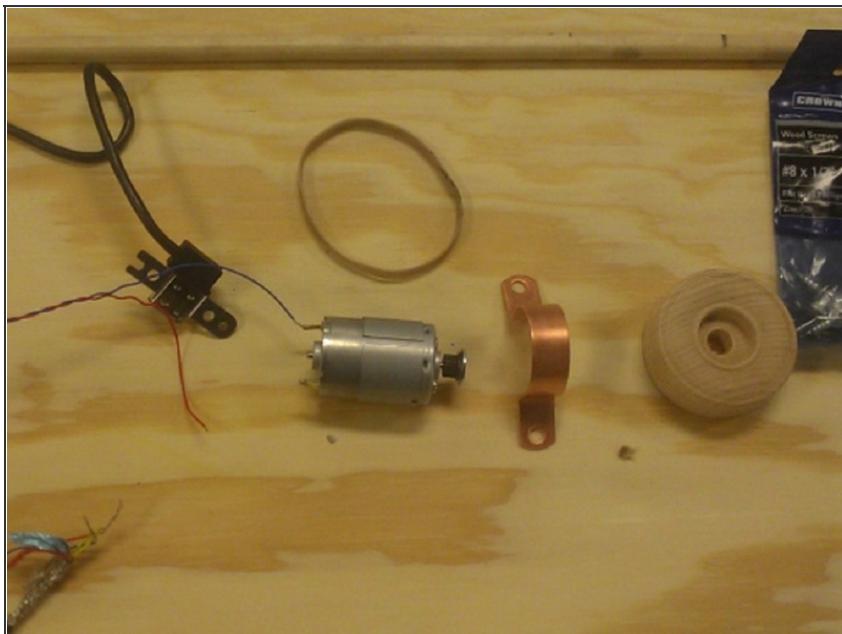
## Step 4 — Electrical Installation, Part 3: Connect the Motor to the USB Cable

- Once you have the voltage and current determined, and they are in the correct range, you can hook up your USB cable and get your phone charging off the drill press.
- Take a look at your USB cable. Cut off the connector a couple of inches from the male end (or a female end if it is a female/female cable).
- There should be some wire shielding surrounding the wires inside, so tear this back as we will not be using it. Inside, there should be 4 wires: two small red ones, which carry data back and forth, and two more wires for power. These other two are the ones you will need.
- Look for a wire that either is black or has a black stripe running down it. This will be your ground. Attach the other wire to your positive wire on the motor, and attach the ground to the other wire on your motor. Twist the wires together a few times and cover with electrical tape.
- The two data cables and ground should also be twisted together and covered with electrical tape.

## Step 5 — Electrical Installation, Part 4: Phone Charging Test

- Plug the USB cord for your phone into the female connector. Now we will go back to spinning the motor with the drill press. However, start slower than before. Spin it and keep increasing the speed if you don't see the phone charging.
- Do not go above the RPM you were using before. Your phone should start showing that it is charging if everything is hooked up correctly.
- Many USB cable manufacturers use different color codes, so if your phone does not charge perhaps you might want to switch the wires around, or you can try rotating the motor the other way. If your phone starts charging, then congratulations; you are one step closer to having your very own bike charger.

## Step 6 — Case Installation, Part 1: Materials and Hardware Needed



- Plywood sheet, dowel rod, wheel, rubber band or belt drives supplied with the printer, DC motor, USB connector (if the printer has it), motor bracket.
- Hot glue gun, zip ties, drill, band saw, finishing gun (staples or nails). If you don't have a finishing gun small nails and a hammer will work, or small screws and a drill.

## Step 7 — Case Installation, Part 2: Measuring Area



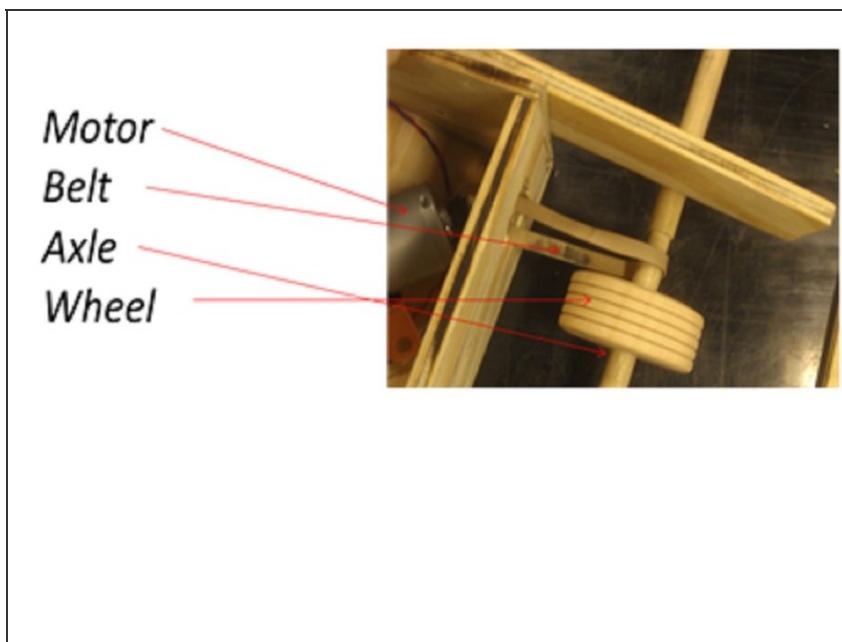
- Measure out the dimensions for your chosen area of the bicycle. From here I would suggest that you make a quick prototype so any details that aren't obvious become apparent. It helps finalize some dimensions and mounting locations as well.
- There should be a mounting area that you can securely fasten the case down to. It needs to be secure to ensure that the drive belt doesn't move around a great deal.

## Step 8 — Case Installation, Part 3: Cutting Wood



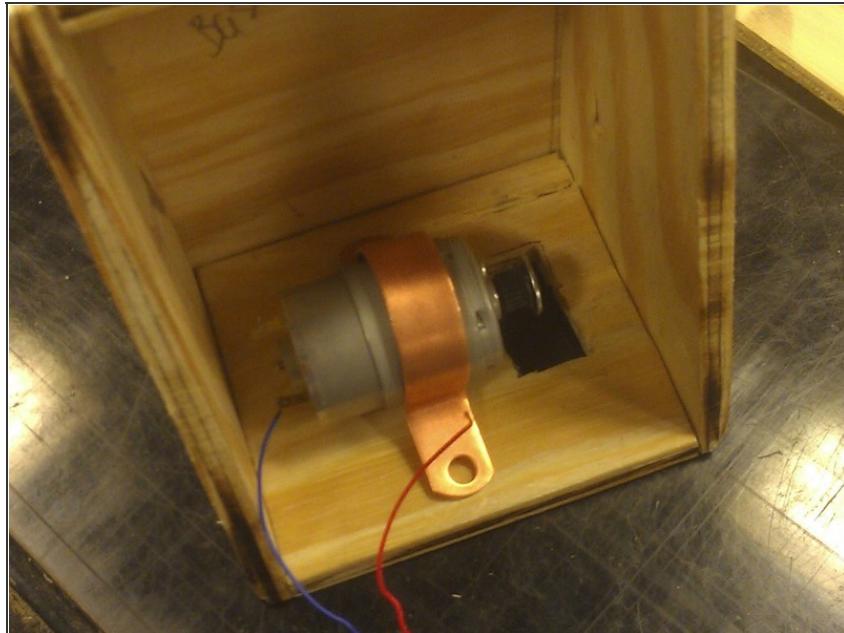
- Cut the wood into the desired dimensions that fit your bicycle. Use the finishing gun to assemble the case.
- Every bicycle has different dimensions for the area that will be used. The amount of wood needed will be determined by the size and shape of each individual box.

## Step 9 — Case Installation, Part 4: Axle Arms



- Place the case at the desired location on the bike. Make measurements for the axle arms so that they are resting above the tire. Then go cut them out of the plywood. Attach the arms to the case securely. I would suggest that you glue them into place then screw them in to ensure that they are rigid.
- The axle arms are one of the key features for this device. They have to be rigid, and the holes in the axle arms have to be correctly drilled to ensure that the wheel rests on the back tire.

## Step 10 — Case Installation, Part 5: Motor Mounting



- Mount the motor and electrical components inside the case. Make sure there is clearance for the belt in the cutout for the motor drive. Position the motor drive so that there is no interference between the case and belt.
- In the printer there were a number of small belts that are made for the teeth of the motor drive. DO NOT throw these away; they will help provide a very good contact between the motor and the belt.

## Step 11 — Case Installation, Part 6: Axle

- Align the axle (dowel rod), and wheel with the drive of the motor. Glue the wheel to the axle in the desired location over the bike tire. Place the belt (rubber band) on the axle before you secure the axle to the arms.
- The wheel and axle act as one system, so when the wheel spins the axle will also spin.

## Step 12 — Case Installation, Part 7: Finishing Touches



- Attach the belt to the motor. (Make sure that they are lined up; cutting a groove in the axle can help ensure this alignment.) Put the top on the case and ride.
- The case shown doesn't have the top on it to show how everything fits together. A cloth pouch can be attached to the side of the case to hold the cell phone when traveling.

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